Topic: Respiratory monitoring
Title: NAVA enhances ventilatory variability and diaphragmatic activity/tidal volume coupling
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INTRODUCTION: Neurally Adjusted Ventilatory Assist (NAVA) is a new ventilatory mode in which ventilator settings are adjusted based on the electrical activity detected in the diaphragm (Eadi). This mode offers significant advantages in mechanical ventilation over standard pressure support (PS) modes, since ventilator input is determined directly from patient ventilatory demand. Therefore, it is expected that tidal volume (Vt) under NAVA would show better correlation with Eadi compared with PS, and exhibit greater variability due to the variability in the Eadi input to the ventilator.

OBJECTIVES: To compare tidal volume variability in PS and NAVA ventilation modes, and its correlation with patient ventilatory demand (as characterized by maximum Eadi).

METHODS: A comparative study of patient-ventilator interaction was performed for 22 patients during standard PS with clinician determined ventilator settings; and NAVA, with NAVA gain set to ensure the same peak airway pressure as the total pressure obtained in PS. A 20 minute continuous recording was performed in each ventilator mode. Respiratory rate, Vt, and Eadi were recorded. Tidal volume variance and Pearson correlation coefficient between Vt and Eadi were calculated for each patient. A periodogram was plotted for each ventilator mode and each patient, showing spectral power as a function of frequency to assess variability.

RESULTS: Median, lower quartile and upper quartile values for Vt variance and Vt/Eadi correlation are shown in Table 1. The NAVA cohort exhibits substantially greater correlation and variance than the PS cohort.

Table: Variance and Correlation for PS and NAVA

Patient Cohort	Variance in Vt		Correlation (Eadi vs Vt)	
	PS	NAVA	PS	NAVA
Lower quartile	793	5218	0.0405	0.5971
Median	3043	10798	0.2563	0.6618
Upper Quartile	5398	23715	0.3517	0.7618

Power spectrums for Vt and Eadi are shown in Figure 1 (PS and NAVA) for a typical patient. The enlarged section highlights how changes in Eadi are highly synchronized with NAVA ventilation, but less so for PS.

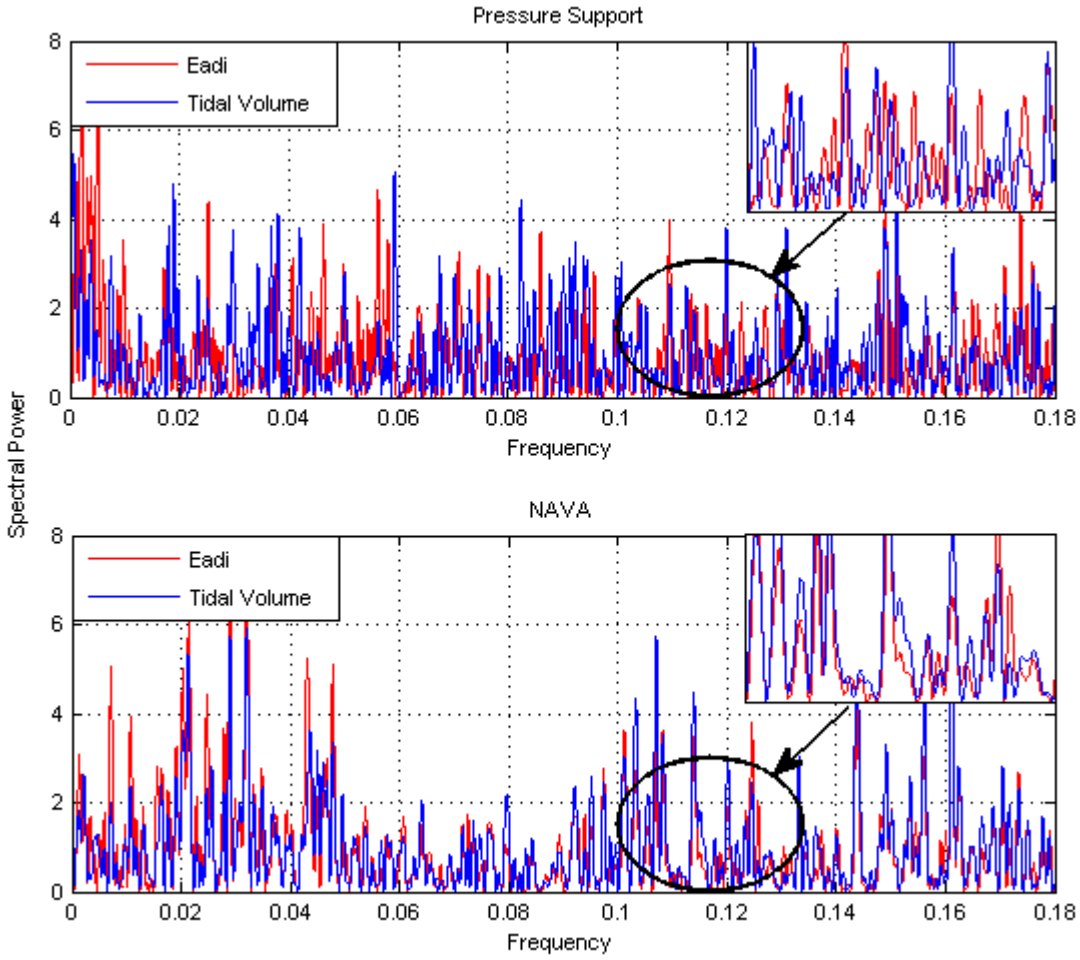

Figure 1: Power Spectrum under PS and NAVA

CONCLUSIONS: There is greater variability in tidal volume and correlation between tidal volume and diaphragmatic electrical activity with NAVA compared to PS. These results are consistent with the improved patient-ventilator synchrony reported in the literature.